

REMARKS

Claims 36 - 44 are being added. Claims 24 - 35 are being cancelled. Claims 6-7 and 23 are being amended. Upon entry of this amendment claims 1-23 and 36-40 will be pending in the application.

The rejection of claim 1 under 35 U.S.C. §112, second paragraph.

Claims 6-23 were rejected under U.S.C. §112, second paragraph as allegedly being indefinite.

- claim 6.

Claim 6 was rejected as allegedly being unclear as to whether the wire is an element of the component or the wire is of the polymer in claim 6. Claim 6 has been amended to more clearly recite that the orthodontic component of claim 1, which comprises a rigid backbone polymer, is in the form of a wire having a shape capable of providing a good fit in an orthodontic bracket.

- claim 7

Claim 7 was rejected under 35 USC § 112 because recitation of "the non-rigid backbone polymer" lacks sufficient antecedent basis. Claim 7 has been amended to provide antecedent basis for the phrase "non-rigid backbone polymer".

- claim 23

Claim 23 was rejected because the phrase "the thermoplastic material" lacks sufficient antecedent basis. Claim 23 has been amended to recite, in pertinent part, "the thermoplastic polymer". This phrase is supported by independent claim 8 from which claim 23 directly depends.

- claim 8

Claims 8-22 were rejected under 35 USC § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection appears to be related to a question as to whether the properties for the thermoplastic polymer of claim 8 are in the neat resin form in the orthodontic component. As discussed further below, claim 8 encompasses orthodontic components in the neat resin form.

The rejection of claims 1-8, 10, 12-14, 16-17 and 21-22 under 35 U.S.C. §102(b).

Claims 1-8, 10, 12-14, 16-17 and 21-22 were rejected under 35 U.S.C. §102(b) as having each and every feature and interrelationship anticipated by U.S. Patent No. 4,717,341 to A. Jon Goldberg et al.

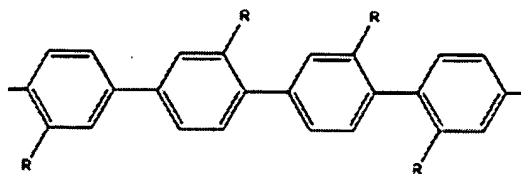
- **The rejection of claims 1-7.**

- Applicant's disclosure teaches that a rigid backbone polymer comprises direct covalent bonding of one arylene (phenylene ring) or heteroarylene group to another arylene (phenylene ring) or heteroarylene group along the polymer backbone.

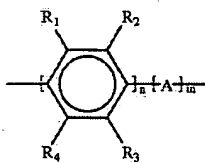
Page 11, lines 8-11 explicitly defines the term "rigid backbone polymer" to encompass any of a rigid-rod polymer, a segmented rigid-rod polymer and a semi-rigid-rod polymer or a combination thereof.

Pages 11 to 13 of Applicant's specification define what is meant by a rigid-rod polymer, a segmented rigid-rod polymer and a semi-rigid-rod polymer. One feature of these polymers is the direct covalent bonding of one arylene (phenylene ring) or heteroarylene group to another arylene (phenylene ring) or heteroarylene group along the polymer backbone.

In some embodiments of a rigid-rod polymer at least about 95% of the direct covalent bonds are substantially parallel due to the preferred 1,4 or para linkages, as shown in the figure below. See, for example, Applicant's specification at page 11, line 33 to page 12, line 21.



Segmented rigid-rod polymers comprise segments having direct covalent bonding of one arylene (phenylene ring) or heteroarylene group to another arylene (phenylene ring) or heteroarylene group along the polymer backbone interspersed with non rigid-rod segments as shown in the figure below, where n is about 8 and m is at least 1. See, for example, Applicant's specification at page 12, line 22 to page 13, line 12.



Semi-rigid-rod polymers include a backbone comprising direct covalent bonding of one arylene (phenylene ring) or heteroarylene group to another arylene (phenylene ring) or heteroarylene group along the polymer backbone interspersed with non-parallel, phenylene monomer units. See, for example, Applicant's specification at page 13, lines 13-25.

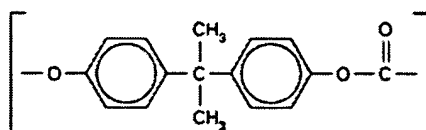
- Applicant's claims recite the presence of compatibilizing or solubilizing side groups in the rigid backbone polymer.

A poly(paraphenylene) polymer per se is not ideal because it may not blend with other polymers and it is extremely difficult to process. Thus, appropriate modifications are made to the polymer structure of a rigid backbone polymer to help maintain the high mechanical properties that result from the covalently linked arylene groups, while making the polymer compatible and processable. This is typically accomplished in

three different ways: (i) by proper selection of the R (compatibilizing or solubilizing) side groups in the rigid-rod polymer; (ii) by the addition of non-rigid-rod segments in the backbone for the segmented rigid-rod polymer (while also using some compatibilizing or solubilizing side groups); and (iii) by the introduction of non-parallel (1,3 or meta) links in the backbone for the semi-rigid-rod polymer (while also using some compatibilizing or solubilizing side groups).

- standard engineering plastics do NOT have direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone.

In clear contrast to a rigid backbone polymer, in all other standard engineering plastics that include an arylene group in the backbone, there is NO direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone. There is always an intermediate atom, typically a carbon, oxygen or sulfur. This is demonstrated in the structure for polycarbonate shown below.



Applicant also encloses copies of two pages (53-54) from the ASM Engineering Plastics Handbook, Volume 2, showing this pattern of intermediate atoms between the arylene rings for other polymer structures. None of the polymers in these pages have a direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group in the polymer backbone.

- The '341 reference does NOT teach or suggest use of materials having direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone.

The '341 reference is directed to a force imparting orthodontic appliance system wherein the components thereof are formed from fiber reinforced composite material comprising a polymeric matrix and at least five percent of a reinforcing fiber embedded in the matrix. See the Abstract. The '341 reference at column 8, lines 22 to 32 discloses a number of polymeric matrices suitable for use in the orthodontic appliance system therein. Examples 1 to 13 also disclose a number of polymers suitable for use in the orthodontic appliance system therein. None of the polymers taught or suggested in the '341 reference appear to have direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone.

The Office communication points to Example 12 for a teaching of a rigid backbone polymer and solubilizing groups. Example 12, as reported in Table IV discloses polyacetal, polycarbonate, polyethylenephthalate, polyethersulfone and polyphenylenesulfide. As shown in the two pages from the ASM Engineering Plastics Handbook, polycarbonate, polyethylenephthalate and polyphenylenesulfide do NOT have direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone. As shown in the attached page (5) from The Condensed Chemical Dictionary, tenth edition, polyacetal does NOT have direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone. As shown in the attached page (Page 2 of 4) from http://www.chemsystems.com/newsletters/perp/Apr05_N03S12.cfm, polyethersulfone does NOT have direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone.

- The '341 reference does NOT teach or suggest use the use of compatibilizing or solubilizing side groups along the polymer backbone.

As discussed above the '341 reference discloses a number of polymers suitable for use in the reinforced composite system therein. There is no teaching or suggestion in the '341 reference concerning the use of compatibilizing or solubilizing side groups in the polymer backbone.

- Claims 1-7 are not anticipated, and therefore patentable, because the cited reference does not teach or suggest all of the features in claims 1-7.

"It is axiomatic that for prior art to anticipate under §102 it has to meet every element of the claimed invention." Hybritech Inc. v. Monoclonal Antibodies, Inc., 213 USPQ 81 (Fed. Cir. 1986); Stoller v. Ford Motor Co., 18 USPQ2d 1545, 1547 (Fed. Cir. 1991).

As discussed above the '341 reference does not appear to teach or suggest at least direct covalent bonding of one arylene (phenylene ring) group to another arylene (phenylene ring) group along the polymer backbone. Further, there is no teaching or suggestion in the '341 reference concerning the use of compatibilizing or solubilizing side groups in the polymer backbone. Claims 1-7 are not anticipated by the '341 reference for at least these reasons.

- **The rejection of claims 8, 10, 12-14, 16-17 and 21-22.**
- Claim 8 recites that the thermoplastic polymer has certain properties.

Claim 8 recites "An orthodontic component, comprising a thermoplastic polymer, wherein the thermoplastic polymer in the neat resin form has an unreinforced tensile strength of at least about 150 MPa and an unreinforced tensile modulus of at least about 4 GPa."

- The Office communication admits that the properties recited in claim 8 are not found in the '341 reference.

The Office communication states, with underlining added:

. . . patentable weight is not given to the intermediate products used in the process by which the component is made. It is noted that the mechanical properties of the intermediate product are claimed and not that of the final product. Goldberg et al show final product having flexural modulus and flexural strength exceeding (almost double in some examples) of the claimed tensile modulus and tensile strength of the neat resin form; although the tensile modulus and tensile strength of Goldberg et al may test to be lower than the flexural modulus and flexural strength, it is believed that the claimed limitations would be met, if they were of the final product.

Clearly, the Office communication admits that the '341 reference does not teach or suggest an orthodontic component having the properties recited in claim 8. The Office communication attempts to overcome this lack of teaching by asserting that the recited properties must be for an intermediate product and are therefore given no weight.

- The Office communication interpretation of claim 8 is mistaken.

There is nothing in the language of claim 8 that indicates that the neat resin form of the polymer must be an "intermediate product". In fact, claim 8 clearly encompasses an orthodontic component made only from a thermoplastic polymer in the neat resin form having the recited tensile strength and tensile modulus. This is further illustrated by claim 12 which explicitly recites that the orthodontic component of claim 8 "further comprises" a reinforcing agent or by claim 13 which recites that the orthodontic component of claim 8 "consists essentially of" the thermoplastic polymer and no more than 5 percent by component weight of a reinforcing agent. The cannon of claim differentiation would require claim 8 to be broader than either claim 12 or 13.

Applicant has also added new claims 41 to 44 to even more explicitly claim embodiments wherein the thermoplastic having the recited properties is the final orthodontic component.

- The cited reference does not teach or suggest all of the features of Applicant's claims 8, 10, 12-14, 16-17 and 21-22.

As discussed above the '341 reference does not teach or suggest an orthodontic component, comprising a thermoplastic polymer, wherein the thermoplastic polymer in the neat resin form has an unreinforced tensile strength of at least about 150 MPa and an unreinforced tensile modulus of at least about 4 GPa. Claims 8, 10, 12-14, 16-17 and 21-22 are not anticipated by the '341 reference for at least this reason.

The rejection of claims 9, 11 and 19-20 under 35 U.S.C. §103(a).

Claims 9, 11 and 19-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,717,341 to A. Jon Goldberg et al.

As stated in MPEP §2143, to establish a *prima facie* case of obviousness three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

- The cited references do not teach or suggest all of the features of Applicant's claims 9, 11 and 19-20.

As discussed above the '341 reference does not teach or suggest an orthodontic component, comprising a thermoplastic polymer, wherein the thermoplastic polymer in the neat resin form has an unreinforced tensile strength of at least about 150 MPa and an unreinforced tensile modulus of at least about 4 GPa. Claims 9, 11 and 19-20 are not obvious over the '341 reference for at least this reason.

The rejection of claims 15 and 18 under 35 U.S.C. §103(a).

Claims 15 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable

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Response to Office communication dated: 10/13/2005

Attorney Docket: UCON/204/US

over U.S. Patent No. 4,717,341 to A. Jon Goldberg et al. in view of U.S. Patent No. 5,174,753 to Wool.

As discussed above the '341 reference does not teach or suggest an orthodontic component, comprising a thermoplastic polymer, wherein the thermoplastic polymer in the neat resin form has an unreinforced tensile strength of at least about 150 MPa and an unreinforced tensile modulus of at least about 4 GPa. The '753 reference is similarly deficient in teaching or suggesting these properties. Claims 15 and 18 are not obvious over the '341 reference in view of the '753 reference for at least this reason.

The rejection of claim 23 under 35 U.S.C. §103(a).

Claim 23 was rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,717,341 to A. Jon Goldberg et al. in view of U.S. Patent No. 6,267,590 to Barry et al. The Office communication asserts "It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the component of Goldberg et al with the coating of Barry et al. in order to provide antimicrobial protection in view of Barry."

As discussed above the '341 reference does not teach or suggest an orthodontic component, comprising a thermoplastic polymer, wherein the thermoplastic polymer in the neat resin form has an unreinforced tensile strength of at least about 150 MPa and an unreinforced tensile modulus of at least about 4 GPa. The '590 reference is similarly deficient in teaching or suggesting these properties. Claim 23 is not obvious over the '341 reference in view of the '590 reference for at least this reason.

The '590 reference is directed to using an "inorganic antimicrobial agent" (reference numeral 14) as a coating over a dental appliance (reference numeral 12). The "preferred antimicrobial agent is ceramic particles . . . containing antimicrobial metal ions . . ." See the '590 abstract and Figure 2 therein. The '590 reference does indicate that the coating may also comprise polymeric materials.

The proposed combination is requires the presence of inorganic antimicrobial agents. Applicant's claim 23 and claim 8 from which it directly depends do not require

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such inorganic agents. Claim 23 is not obvious over the '341 reference in view of the '590 reference for at least this reason.

In summary, Applicants have addressed each of the objections and rejections within the present Office Action. It is believed the application now stands in condition for allowance, and prompt favorable action thereon is respectfully solicited.

The Examiner is invited to telephone Applicant(s)' attorney if it is deemed that a telephone conversation will hasten prosecution of this application.

Respectfully submitted,

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Table 3 Chemical structures, glass transition temperatures, and melting temperatures of representative heterochain thermoplastic polymers

Chemical name	T_g		T_m		Mer chemical structure
	$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$	
Polyethylene oxide	-67 to -27	-90 to -15	62 to 72	145 to 160	$\left[\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ -\text{C}-\text{C}-\text{O}- \\ \quad \\ \text{H} \quad \text{H} \end{array} \right]$
Polyoxymethylene	-85	-120	175	345	$\left[\begin{array}{c} \text{H} \\ \\ -\text{C}-\text{O}- \\ \\ \text{H} \end{array} \right]$
Polyamide					
Nylon 6	50	120	215	420	$\left[\begin{array}{c} \text{H} \quad \quad \text{O} \\ \quad \quad \\ -\text{N}-(\text{CH}_2)_5-\text{C}- \end{array} \right]$
Nylon 6/10	40	105	227	440	$\left[\begin{array}{c} \text{H} \quad \quad \text{H} \quad \quad \text{O} \quad \quad \text{O} \\ \quad \quad \quad \quad \quad \quad \\ -\text{N}-(\text{CH}_2)_6-\text{N}-\text{C}-(\text{CH}_2)_6-\text{C}- \end{array} \right]$
Polyethylene terephthalate	69	155	265	510	$\left[\begin{array}{c} \text{H} \quad \text{H} \quad \quad \text{O} \quad \quad \text{O} \\ \quad \quad \quad \quad \quad \\ -\text{O}-\text{C}-\text{C}-\text{O}-\text{C}-\text{C}_6\text{H}_4-\text{C}-\text{C}- \end{array} \right]$
Polycarbonate	150	300	265	510	$\left[\begin{array}{c} \text{CH}_3 \quad \quad \text{O} \\ \quad \quad \\ -\text{O}-\text{C}_6\text{H}_4-\text{C}-\text{C}_6\text{H}_4-\text{O}-\text{C}- \end{array} \right]$
Polydimethyl siloxane (silicone rubber)	-123	-190	-54	-65	$\left[\begin{array}{c} \text{CH}_3 \\ \\ -\text{Si}-\text{O}- \\ \\ \text{CH}_3 \end{array} \right]$

Source: Ref 1-3 and product information sheets

varying degrees of thermosetting properties.

Polymer Names

Even for the experienced, it is not always easy to decipher the meaning of the names given to polymers. This is because a given polymer may have as many as four different types of names assigned to it.

The **systematic name** is that assigned according to nomenclature rules adopted by the International Union of Pure and Applied Chemistry. Such a name is unique to the specific polymer and completely specifies the chemical structure of the simplest mer unit that can be described for the polymer. The systematic name for PE is poly(methylene), that for PS is poly(1-phenylethylene), and that for PVC is poly(1-chloroethylene) (Ref 4). Although naming polymers by such a system seems to be a

good approach, systematic names are not widely used. This is because the nomenclature rules are quite complicated, many of the resulting names are quite lengthy, and other names have simply become accepted.

The **chemical name** is used by polymer chemists in most of their descriptions. In some cases, this name is the same as the systematic name, and sometimes it is a shortened version of the systematic name, which lumps together several slightly different polymers under one term. However, there are many occasions when the chemical name is the one customarily used. It is invariably a name that resembles a systematic name in that it is composed of the poly- prefix followed by a chemical group. Polyethylene, polystyrene, and polyvinyl chloride are all examples of such names.

The **customary name** (or common name) often lumps together even more polymers than does the chemical one.

Such names are unpredictable, being derived from early marketing terms for the material, modified chemical names, or other sources. They are often used in a generic sense to describe a group of polymers without using proprietary commercial names. Such names include vinyl, acrylic, and nylon.

The **commercial name** is assigned by the company marketing the polymer and is usually proprietary. A given polymer may have several different commercial names, because several different companies may market the same polymer, and the same commercial name may refer to several different polymers. However, some of these names, such as nylon, have been allowed to become generic and are now used as customary names.

Because the chemical name is still the most commonly used by polymer scientists, this article will generally refer to polymers by their chemical names or, for groups of

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Table 4 Chemical structures, glass transition temperatures, and melting temperatures of representative thermoplastic polymers for high-temperature service

Chemical name	T_g		T_m		Mer chemical structure
	$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$	
Poly <i>p</i> -phenylene terephthalamide (aromatic polyamide or aramid) ..	375	705	~640(a)	~1185	
Polyaromatic ester	421	790	
Polyetheretherketone	143	290	334	635	
Polyphenylene sulfide	85	185	285	545	
Polyamide-imide	277-289	530-550	(b)		
Polyether sulfone	225	435	(b)		
Polyether-imide	215	420	(b)		
Polysulfone.....	193	380	(b)		
Polyimide (thermoplastic)	280-330	535-625	(b)		

(a) $T_d = 500^{\circ}\text{C}$ (930 $^{\circ}\text{F}$). R contains at least one aromatic ring. (b) Polymer is generally 95% or more noncrystalline. Any T_m given is for remaining crystalline portion or for crystalline version.
Source: Ref 1 to 3 and product information sheets

amidothioic acid ester)

m.p. 65°C; soluble in acetone and alcohol. by ingestion.

hoxyethane; ethylenedi-
[3]2.
ile liquid; agreeable odor;
to alkalis but readily
ids. Forms a constant-
yl alcohol. Soluble in
Sp. gr. 0.831; b.p. 103-
0 mm (20°C); flash point
°C; specific heat 0.520;
(20°C); wt (lb/gal) 6.89;
(230°C).
ion of ethyl alcohol, the
d condensing with the

le. Dangerous fire risk.
65 to 10.4%. Moderately
concentrations.

organic synthesis; per-

l, Air) Flammable Liquid

hyde; aldehyde; ethanal;
b.

id; pungent, fruity odor.
p. 20.2°C; m.p. -123.5°C;
(20°C); flash point -40°F
ific heat 0.650; refractive
50 lb/gal (20°C); miscible
r, benzene, gasoline, sol-
xylene, turpentine and

i of ethylene; (b) vapor-
nol; (c) vapor-phase oxi-
tane; (d) catalytic reaction
hiefly in Germany).

rank cars.
e; toxic (narcotic). Danger-
k. Explosive limits in air 4
ppm in air.

etic acid and acetic anhy-
ylhexanol, peracetic acid,
ridines, chloral, 1,3-butyl-
ethylolpropane; synthetic

oil, Air) Flammable Liquid
ssenger.

See aldehyde ammonia.

See lactonitrile.

acetaldol. See aldol.

acetal resin (polyacetal). A polyoxymethylene thermo-
plastic polymer obtained by ionically initiated polym-
merization of formaldehyde (CH_2O) to obtain a
linear molecule of the type $-\text{O}-\text{CH}_2-\text{O}-\text{CH}_2-\text{O}-\text{CH}_2-$.
Single molecules may have over 1500 $-\text{CH}_2\text{O}-$ units.
As the molecule has no side chains, dense crystals
are formed. Acetal resins are hard, rigid, strong,
tough and resilient; dielectric constant 3.7; dielectric
strength 1200 volts/mil (20-mil), 600 volts/mil (80-
mil); dimensionally stable under exposure to mois-
ture and heat, resistant to chemicals, solvents,
flexing and creep, and have a high gloss and low
friction surface. Can be chromium-plated, injection-
molded, extruded, and blow-molded. Not recom-
mended for use in strong acids or alkalis. They may
be homopolymers or copolymers.

Properties: Sp. gr. 1.425; thermal conductivity 0.13
Btu/hr/sq ft/°F/ft; coefficient of thermal expansion
 4.5×10^{-5} per °F; specific heat 0.35 Btu/lb/°F;
water absorption 0.41%/24 hr; tensile strength
10,000 psi; elongation 15%; hardness (Rockwell)
R120; impact strength (notched) 1.4 ft-lb/in.; flex-
ural strength 14,100 psi; shear strength 9500 psi.
Combustible, but slow burning.

Uses: An engineering plastic, often used as substitute
for metals, as oil and gas pipes; automotive and
appliance parts; industrial parts; hardware; com-
munication equipment; aerosol containers for
cosmetics.

See also "Delrin"; "Celcon."

acetamide (acetic acid amine, ethanamide)

CH_3CONH_2 .

Properties: Colorless deliquescent crystals. Mousy
odor. Soluble in water and alcohol; slightly soluble
in ether. Sp. gr. 1.159; m.p. 80°C; b.p. 223°C;
refractive index 1.4274 (78.3°C). Combustible.

Derivation: Interaction of ethyl acetate and ammo-
nium hydroxide.

Grades: Technical; C.P. (odorless); intermediate;
reagent.

Containers: Fiber cartons.

Hazard: Has caused cancer in experimental animals.

Otherwise low toxicity.

Uses: Organic synthesis (reactant, solvent, peroxide
stabilizer); general solvent; lacquers; explosives;
soldering flux; hygroscopic agent; wetting agent;
penetrating agent.

acetamidine hydrochloride $\text{C}_2\text{H}_6\text{N}_2\text{HCl}$.

Properties: Crystalline solid; slightly deliquescent;
m.p. 166°C; soluble in water and alcohol; insoluble
in acetone. Keep stoppered.

Derivation: Alcohol solution of acetonitrile +
 HCl + ammonia.

Hazard: Skin irritant. Moderately toxic by ingestion.

Use: Synthesis of pyrimidines and related groups of
biochemically active compounds.

acetamido-. Prefix indicating the group $\text{CH}_3\text{CONH}-$.
Also called acetamino- or acetylamino-.

5-acetamido-8-amino-2-naphthalenesulfonic acid
(acetyl-1,4-naphthalenediamine-7-sulfonic acid;
acetyl-amino-1,6-Cleve's acid)
 $\text{C}_{10}\text{H}_5(\text{NHCOCH}_3)(\text{NH}_2)(\text{SO}_3\text{H})$. A reddish brown
paste.

Hazard: May be toxic.

Use: Chemical intermediate; dyes.

8-acetamido-5-amino-2-naphthalenesulfonic acid
(acetyl-1,4-naphthalenediamine-6-sulfonic acid;
acetyl-amino-1,7-Cleve's acid)

$\text{C}_{10}\text{H}_5(\text{NHCOCH}_3)(\text{NH}_2)(\text{SO}_3\text{H})$. A paste.

Hazard: May be toxic.

Use: Chemical intermediate; dyes.

para-acetamidobenzenesulfonyl chloride. See N-
acetylsulfanilyl chloride.

acetamidocyanoacetic ester. See ethyl acetamidocyano-
acetate.

**8-acetamido-2-naphthalenesulfonic acid magnesium
salt** (acetyl-1,7-Cleve's acid)
 $[\text{C}_{10}\text{H}_6(\text{CH}_3\text{CONH})(\text{SO}_3)]_2\text{Mg}$.

Properties: Brownish-gray paste containing approxi-
mately 80% solids.

Use: Intermediate for dyes.

para-acetamidophenol. See para-acetylaminophenol.

"Acetamine."²⁸ Trademark for a group of azo dyes
and developers made for application to acetate yarn,
and especially suited to nylon.

acetamino-. See acetamido-.

acetaminophen. See para-acetylaminophenol.

acetanilide (N-phenylacetamide) $\text{C}_6\text{H}_5\text{NH}(\text{COCH}_3)$.
Properties: White, shining crystalline leaflets or
white, crystalline powder; odorless; stable in air;
slightly burning taste; sp. gr. 1.2105; m.p. 114-
116°C; b.p. 303.8°C; soluble in hot water, alcohol,
ether, chloroform, acetone, glycerol and benzene.
Flash point 345°F (174°C); combustible; autoign-
ition temp. 1015°F (545°C).

Derivation: Acetylation of aniline with glacial acetic
acid.

Grades: Technical; C.P.

Containers: 1-lb cartons; bottles; fiber drums; multi-
wall paper bags.

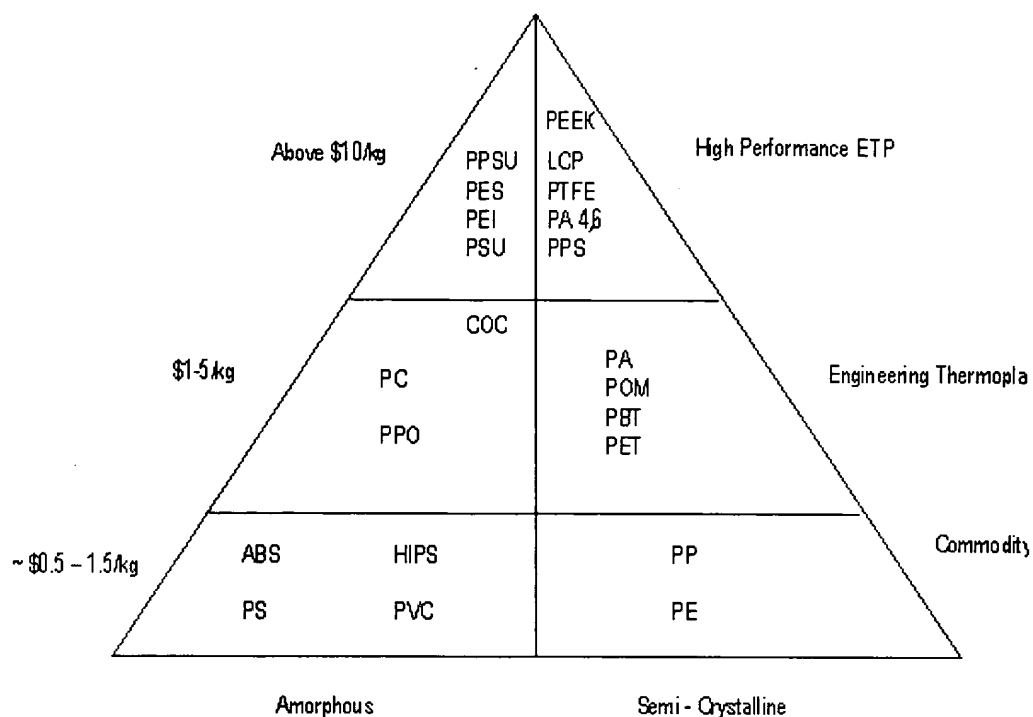
Hazard: Moderately toxic by ingestion.

Use: Rubber accelerator; inhibitor in hydrogen per-
oxide; stabilizer for cellulose ester coatings; manu-
facture of intermediates (para-nitroaniline, para-
nitroacetanilide; para-phenylenediamine); synthetic
camphor; pharmaceutical chemicals; dyestuffs; pre-
cursor in penicillin manufacture; medicine (anti-
septic).

acetanisole. See para-methoxyacetophenone.

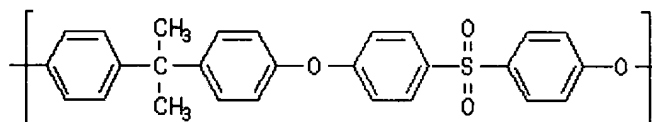
acetate. (1) A salt of acetic acid in which the terminal
H atom is replaced by a metal, as in copper acetate,
 $\text{Cu}(\text{CH}_3\text{COO})_2$.

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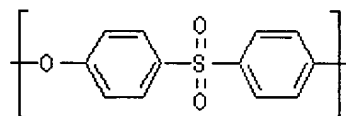
PP: +1ZZ+1ZZ_AT

Figure 2 Polysulfone



Polyethersulfone is synthesized in a similar manner to polysulfone but a higher temperature solvent is generally required such as sulfolane and NMP are known to be used also. The monomers in this case are DCDPS and 4,4'-dihydroxydiphenyl otherwise known as bisphenol S. ICI introduced the first commercial polyethersulfone polymer (VICTREX PES®) in the 1970s. The structure of polyethersulfone is shown in Figure 3.

Figure 3 Polyethersulfone



The resulting molecule is wholly aromatic, and this increases the thermal properties compared to polysulfone both in terms of temperature and also stability close to the glass transition temperature of 223°C.

The main difference in the commercial synthesis of the sulfone polymers tends to be the reaction solvent used and whether the dedicated or multipurpose (being able to produce all sulfone polymers in the same batch process). A number of producers are based on monomer feedstocks.

Polyetherimide

Polyetherimide for melt processable engineering plastics applications is represented by only one commercially available amorphous ULTEM® produced by General Electric Plastics (GE Plastics).

Polyetherimides are synthesized by the melt polycondensation of bisphenol A dianhydride with a diamine, usually m-phenylenediamine. The repeat unit for polyetherimide is shown in Figure 4.